

Amendments to the Claims

Please cancel Claim 24. Please amend Claim 23. Please add new Claims 25-31. The Claim Listing below will replace all prior versions of the claims in the application:

Claim Listing

1. (Original) A sensor for a marine vessel comprising:
 - a housing that fits through a single opening in a hull of the vessel;
 - a removable body disposed in the housing;
 - a magnetized paddlewheel disposed in a first cavity formed on a first half of the body, the paddlewheel having a plurality of paddles extending from a circular central hub and rotatably mounted on an axle extending transverse a fore and aft direction of travel of the vessel;
 - a magnetic sensor located adjacent the paddles; and
 - a sonic transducer disposed in a second cavity formed on a second half side of the body.
2. (Original) The sensor of claim 1, wherein the cross-sectional area of the paddles in a plane transverse a direction of flow of water being traversed by the marine vessel and in a plane parallel the direction of flow versus the available cross sectional area in the respective planes defines a Cross-Sectional ratio in a range between about 0.25 and 0.5, and wherein the lowest point on the periphery of the hub is located tangentially adjacent to or vertically above a lowest point in the first cavity.
3. (Original) The sensor of claim 2, wherein the Cross-Sectional ratio in the plane parallel to the direction of flow is different than the Cross-Sectional ratio in the plane transverse the direction of flow.

4. (Original) The sensor of claim 2, wherein the Cross-Sectional ratio in the plane parallel to the direction of flow is about equal the Cross-Sectional ratio in the plane transverse the direction of flow.
5. (Original) The sensor of claim 1, wherein the paddles are symmetric in shape.
6. (Original) The sensor of claim 1, wherein the sonic transducer is a piezoelectric element having an aspect ratio defined in terms of the length, width, and height of the piezoelectric element, the aspect ratio being optimized such that the maximum acoustic energy of the element is produced when the element vibrates with a frequency of about 150 kHz to about 250 kHz.
7. (Original) The sensor of claim 6, wherein the maximum acoustic energy of the element is produced when the element vibrates with a frequency of about 235 kHz.
8. (Original) The sensor of claim 6, wherein the length is about 1.0 to 1.3 inches in length, about 0.1 to 0.5 inches in height, and about 0.1 to 0.5 inches in width.
9. (Original) The sensor of claim 8, wherein the length is about 1.25 inches, the height is about 0.23 inch, and the width is about 0.22 inch.
10. (Original) The sensor of claim 6, wherein the transducer has a beamwidth of about 11° x 38° at about -3dB.
11. (Original) The sensor of claim 6, wherein the piezoelectric element is made of PZT.
12. (Original) The sensor of claim 1, further comprising a thermal sensor for sensing water temperature disposed in a well formed in the body.
13. (Original) A sensor for a marine vessel comprising:

a housing that fits in a single circular opening through a hull of the vessel, the housing containing at least two sensors, a speed sensor and a depth sensor.

14. (Original) The sensor of claim 13, further including temperature sensor contained within the housing.
15. (Original) The sensor of claim 13, including a seal to prevent water from passing through the opening.
16. (Original) The sensor of claim 13, wherein the speed sensor is a paddlewheel type.
17. (Original) A transducer comprising:
a piezoelectric element having an aspect ratio defined in terms of the length, width, and height of the piezoelectric element, the aspect ratio being optimized such that the maximum acoustic energy of the element is produced when the element vibrates with a frequency of about 150 kHz to about 250 kHz.
18. (Original) The transducer of claim 17, wherein the maximum acoustic energy of the element is produced when the element vibrates with a frequency of about 235 kHz.
19. (Original) The transducer of claim 17, wherein the length is about 1.0 to 1.3 inches in length, about 0.1 to 0.5 inches in height, and about 0.1 to 0.5 inches in width.
20. (Original) The transducer of claim 19, wherein the length is about 1.25 inches, the height is about 0.23 inch, and the width is about 0.22 inch.
21. (Original) The transducer of claim 17, wherein the transducer has a beamwidth of about $11^{\circ} \times 38^{\circ}$ at about -3dB.
22. (Original) The transducer of claim 17, wherein the piezoelectric element is made of PZT.

23. (Currently Amended) A method for installing a removable marine sensor in a marine vessel adapted for traversing water, comprising:
 ~~cutting~~ forming a single through hole in a hull of the marine vessel;
 mounting a housing within the hole, the housing sealing the hole to prevent a ~~liquid~~ water from entering the marine vessel; and
 disposing a removable body in the housing, the body containing at least ~~two~~ sensors, a speed sensor and a depth sensor.
24. Cancel
25. (New) A marine sensor, comprising:
 a cylindrical body having a length and diameter adapted to extend along a vertical axes through a single opening in a hull of a water traversing marine vessel; which opening extends through the deck of the hull to the water;
 a speed sensor disposed in a first portion of the body for sensing the speed of the vessel as it traverses the water; and
 a sonic transducer disposed in a second portion of the body.
26. (New) The marine sensor of claim 25, wherein the sonic transducer is a cubic element occupying a first side of the body adjacent to the speed sensor.
27. (New) The marine sensor of claim 26, wherein the speed sensor comprises a rotatable magnetized paddlewheel disposed adjacent to a magnetic sensor.
28. (New) The marine sensor of claim 27, wherein the paddlewheel sensor has a plurality of paddles mounted on an axle which extends transverse a fore and aft direction of vessel travel.

29. (New) The marine sensor of claim 27, wherein the cubic element has a length L and a width W, wherein $L > W$ and the L dimension is disposed in the body adjacent to and facing the opening.
30. (New) The marine sensor of claim 29, wherein the element produces a sonic beam of energy which extends mainly in the range of $\pm 10^\circ$ fore and aft the vessel and in the range of $\pm 60^\circ$ athwart of the vessel.
31. (New) A marine sensor, comprising:
 - body means having an external dimension capable of extending through a single opening in a hull of the vessel, the body means containing:
 - a) speed sensor means for sensing a speed of the vessel; and
 - b) sonic means for generating a beam of sonic energy.